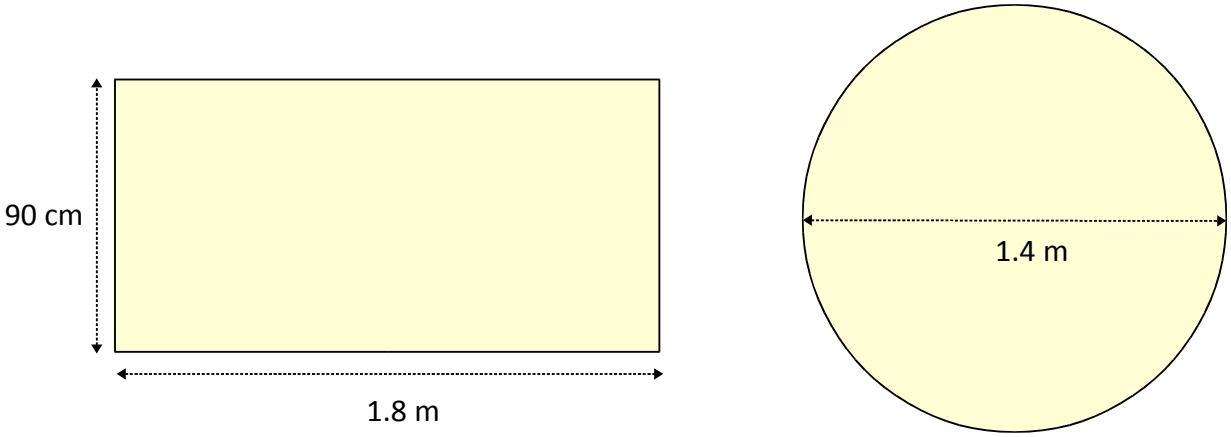
Which table top has the larger area?

A local store offers a choice of two family sized tables, one with rectangular top and the other with a circular top as shown below.



1 Can you work out which table top has the greater area?



Sarah

Well the area of a rectangle is just length x width.

… and the area of a circle is πr^2 where r is the radius of the circle.



Alice



Jon

I see the measurements are given in different units ...



Matthew

Matthew's notes

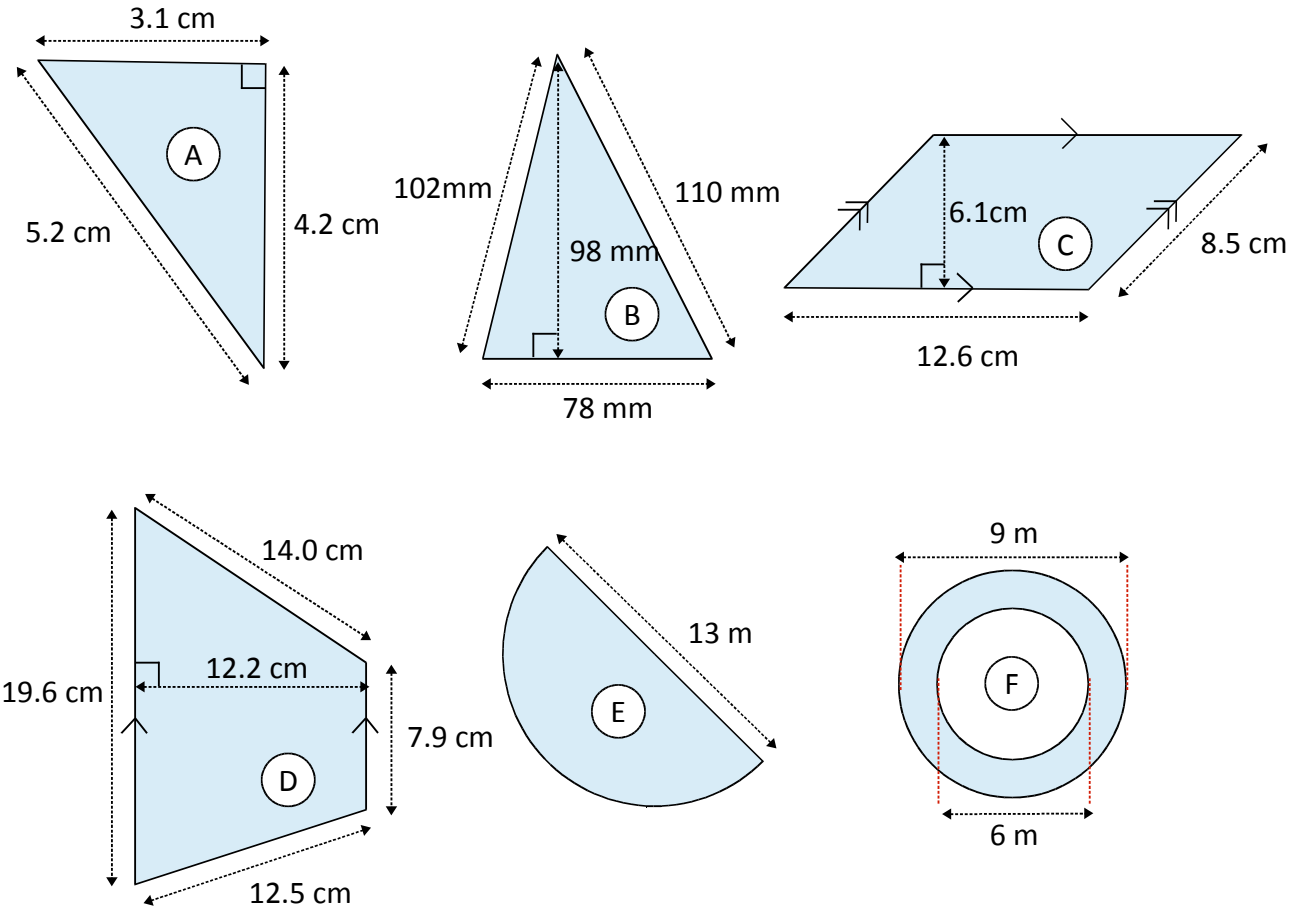
The volume of the rectangular table top is 90 x 180 = 16200 cm^2.

The radius of the circle is 70 cm, so the area of the circular table top is $\pi \times 70^2 = 4900\pi = 15393.8$ cm^2.

So the rectangular table top has the greater area.

What do you remember about calculating area?

2 Can you calculate the shaded area of these shapes?



Some useful formulae that you need to know

Area of a rectangle = length x width.

Area of a parallelogram = base x height.

Area of a triangle = $\frac{1}{2}$ x base x height.

Area of a trapezium = $\frac{1}{2}$ (sum of the parallel sides) x distance between the parallel sides.

Area of a circle = πr^2 (where r is the radius of the circle).

Circumference of a circle = $2\pi r$ or πd (where d is the diameter of the circle).

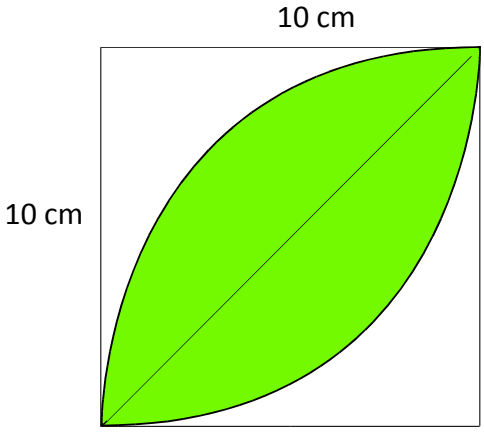
Area

Let's think about how to calculate the area of the shaded part of the figure.



Miss F

Lets think about how to calculate the area of this shape.



3 Which part of the figure can you easily calculate the area?



Alice

Alice's notes



10×10
$= 100\ cm^2$



$10 \times 10 \times 3.14 \div 4$
$= 78.5\ cm^2$



$10 \times 10 \div 2$
$= 50\ cm^2$



Miss F

Now think about how to calculate the area of the shape by combining the three figures above.

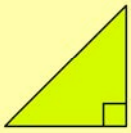


Sarah

Sarah's notes



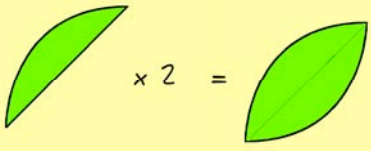
$78.5\ cm^2$



$50\ cm^2$



$28.5\ cm^2$



$28.5 \times 2 = 57\ cm^2$

Think...

Is there anything you have learnt so far that you can use to help you here?

Make notes...

Write your notes in a way others can understand.

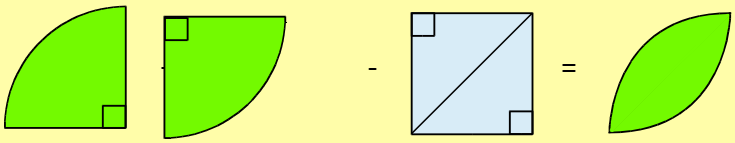
Try to think of more than one way to solve the problem

Area



Jon

Jon's notes



78.5 cm² + 78.5 cm² - 100 cm²

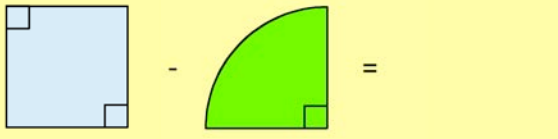
157 − 100 = 57 cm²

4 Look at Jon's idea, and then explain how he worked out the area.

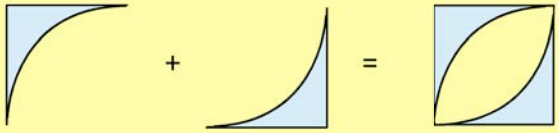


Evie

Evie's notes



100 cm² - 78.5 cm² = 21.5 cm²



21.5 x 2 = 43 cm²

100 − 43 = 57 cm²

5 Look at Evie's idea, and then explain how she worked out the area.



Miss F

What do these ideas have in common?



Matthew

All three of them were combining ideas we already know to calculate the areas...

Find out...

Do you understand your friend's ideas?

What is the same or different from your answer?

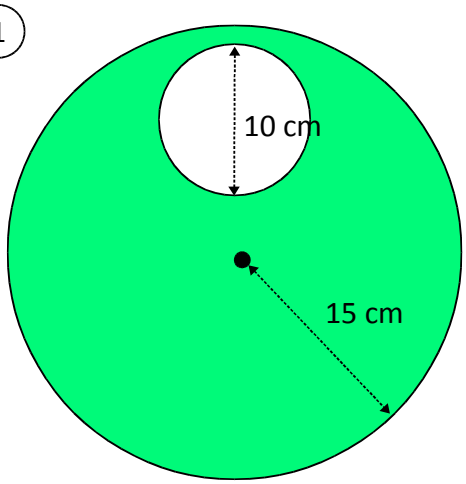
Discuss...

Find good points in your friend's ideas

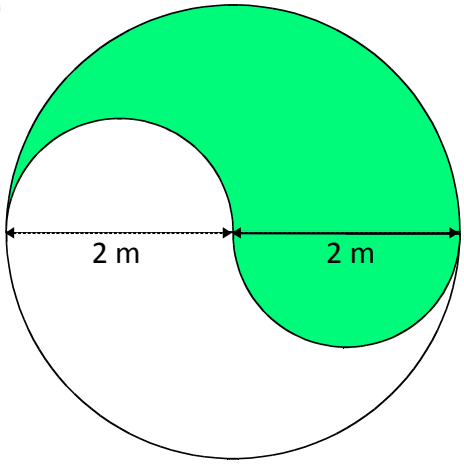
Area of Circles

Calculate the area of the shaded parts in each of these diagrams.

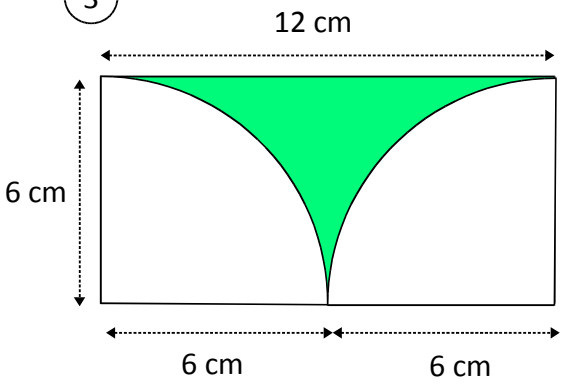
1



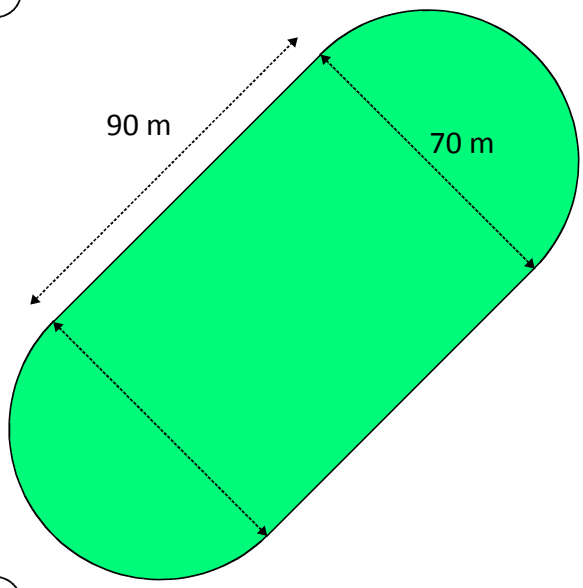
2



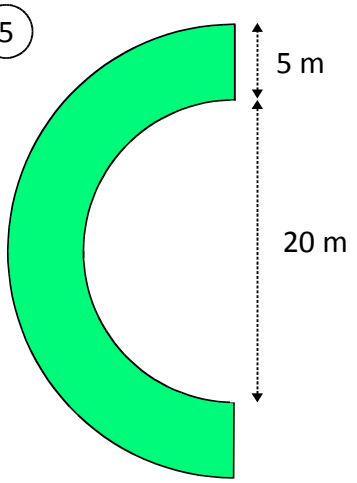
3



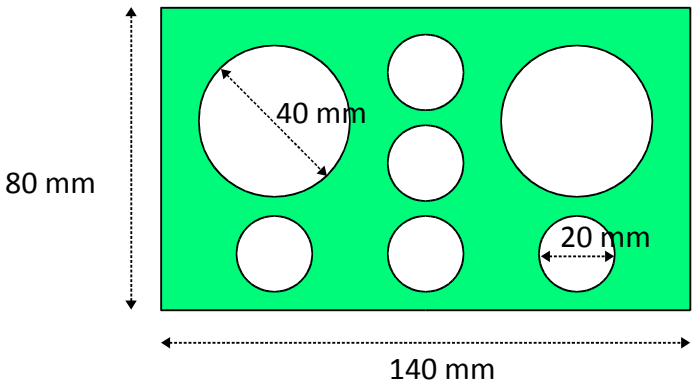
4



5



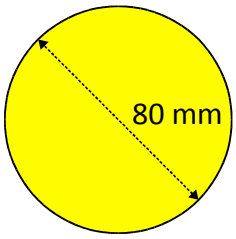
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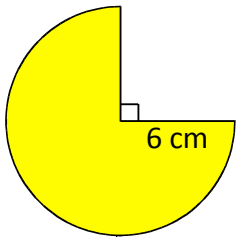


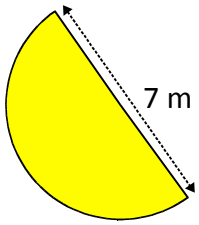
Area

Some questions involving area and perimeter

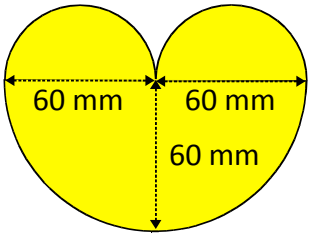
1. Calculate the area and the perimeter of each of these shapes...

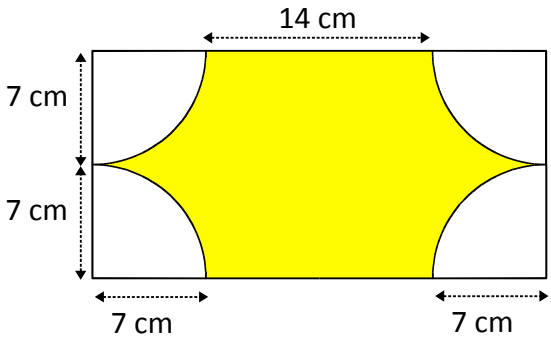




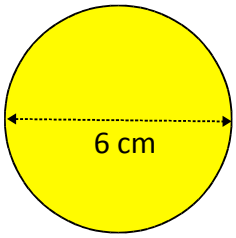


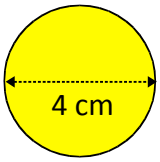
2. Calculate the area and the perimeter of each of the shaded area of these shapes...





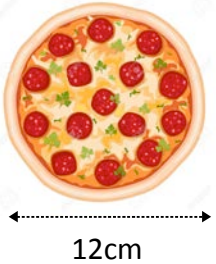
4. How many times longer is the circumference of the larger circle to the circumference of the smaller circle?

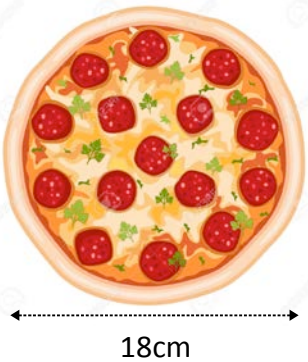




5. It takes 30g of flour to make dough for pizza with a diameter of 12 cm.

   How much flour does it take to make a pizza with the diameter of 18 cm,if the thickness is unchanged?

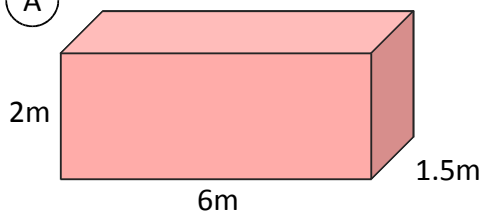




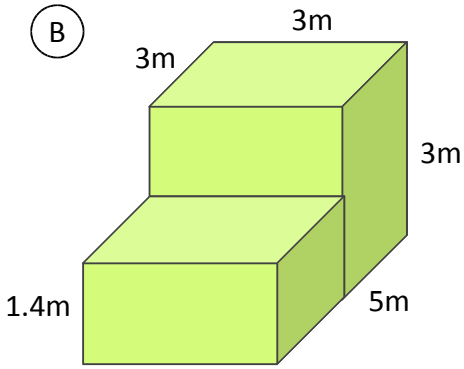
What do remember about 3D shapes?

1. Calculate the volume of these shapes made from cubes and cuboids in both m^3 and cm^3.

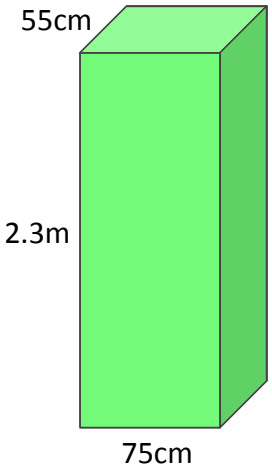
A



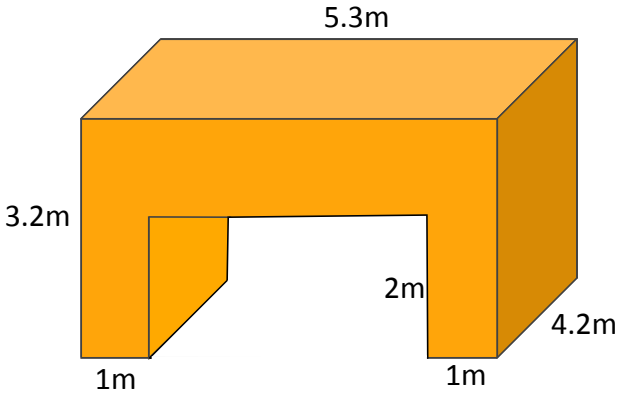
B



C



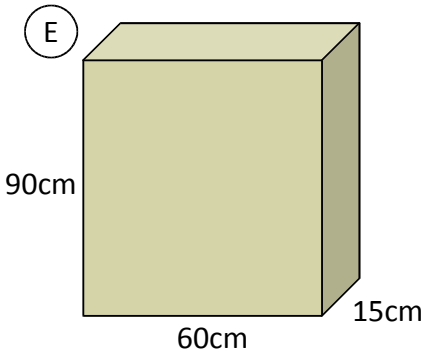
D



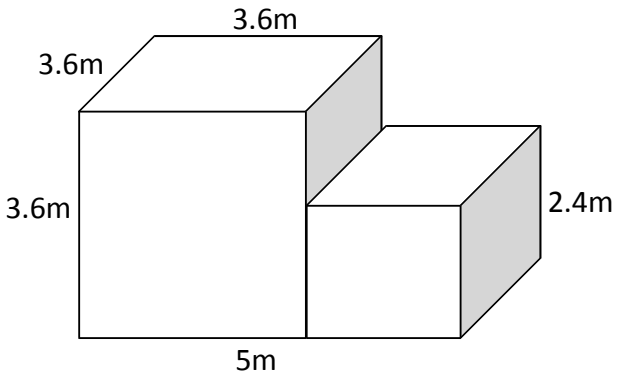
2. In each case calculate the surface area of these shapes in both m^2 and cm^2.

3. Calculate the capacity of these two tanks in litres.

E



F



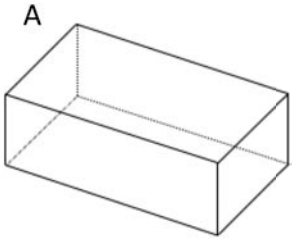
Volume of Prisms



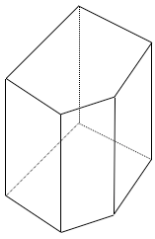
Mr T

Look at these solid shapes.
Choose the solids that share characteristics with solid B and write down the characteristics.

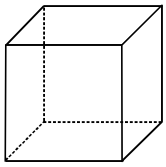
A



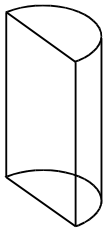
B



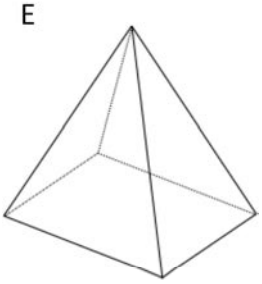
C



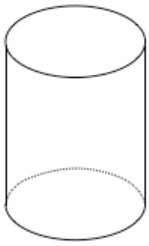
D



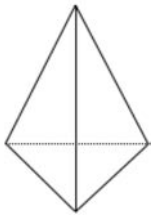
E



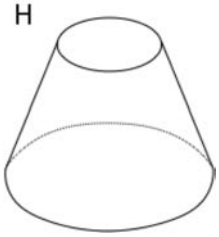
F



G



H





Alice

A, B, C, E and G have got flat faces, straight edges and sharp corners..



Taro

And that means A, B, C, E and G and H are all polyhedra.



Matthew

A, B, C, D and F have got a constant cross section which is the same as the top and the base.



Amber

And that means A, B, C, D and F are all prisms.



Sarah

So not all prisms are polyhedrons.



Jon

And not all polyhedra are prisms. For example E and F are pyramids not prisms.



Mr T

Prisms don't have to be upright, for example ...



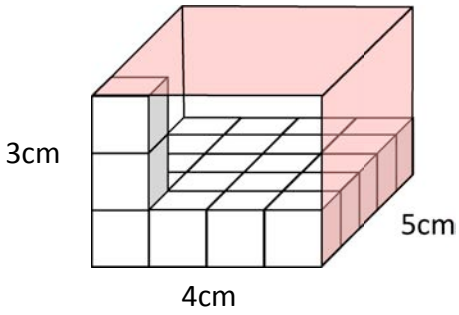
Volume of Prisms

Let's think about finding the volume of prisms



Evie

We already know how to find the volume of a cuboid. Maybe that will help?





Jon

We started by finding the number of cubes required to fill the base – that is 4 x 5 = 20



Evie

… and that is the same calculation as find the cross sectional area of the cuboid.



Amber

We then found the total by multiplying by the number of layers.
So the volume is 20 x 3 = 60cm^3.



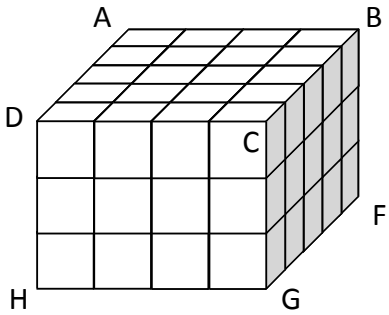
Taro

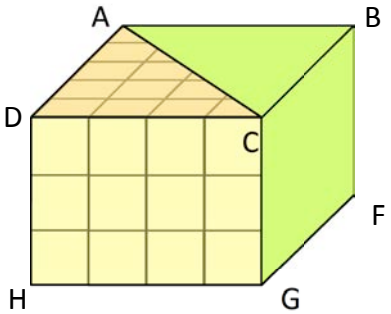
So to find the volume of a prism, we could try finding the area of the base and multiplying by the height.



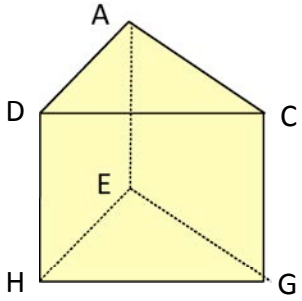
Mr T

Look at this cuboid. If we slice it through ACGE, we get two identical triangular based prisms.





1 Can you explain why the volume of each triangular based prism must be 30cm^3?



2 Now find the area of the base of one of the triangular prisms and multiply by the height. Do you get the same answer?

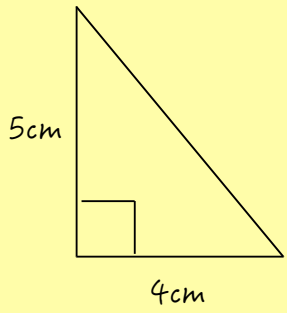
Volume of Prisms

Sarah's notes



Sarah

Plan view



The area of the base will be

$(4 \times 5) \div 2 = 20 \div 2 = 10cm^2$

Multiply this by the height

$10 \times 3 = 30$

And so this method also gives a volume of $30cm^3$.

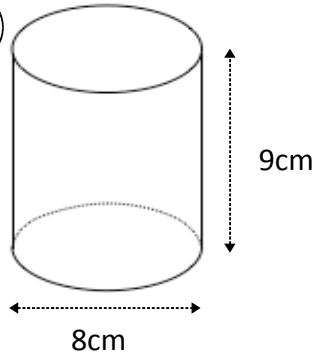


Mr T

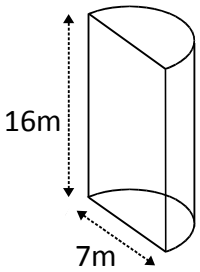
In fact this is true for all prisms.
To find the volume of a prism, calculate the area of the constant cross section and multiply by the height (or width if the prism is lying horizontally).

3 Can you now calculate the volume of these shapes?

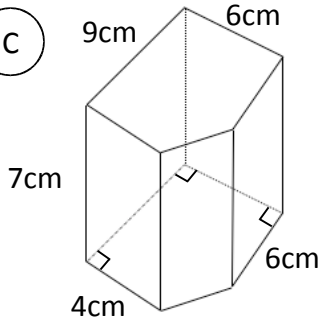
A



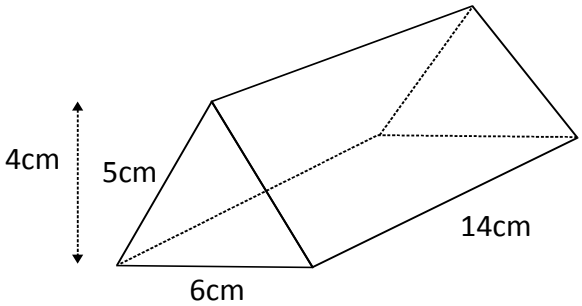
B



C



D



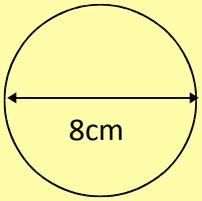
Volume of Prisms



Matthew

Matthew's notes for (A)

Plan view



The radius of the circle = 4cm

So the area of the base will be

$\pi r^2 = 3.14 \times 4^2 = 50.27cm^2$

Multiply this by the height

$50.27 \times 9 = 452.39$

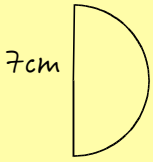
And so the volume is $452.4cm^3$.



Jon

Jon's notes for (B)

Plan view



The radius of the semi circle is 3.5m

So the area of base is

$(\pi r^2 = 3.14 \times 3.5^2) \div 2 = 19.23m^2$

Multiply this by the height

$19.23 \times 16 = 307.7$

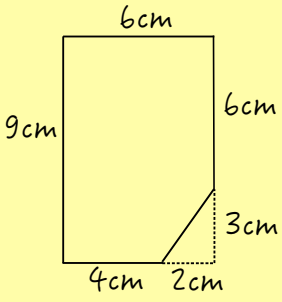
And so the volume is $307.7m^3$.



Amber

Amber's notes for (C)

Plan view



The area of the corner piece = $(2 \times 3) \div 2 = 3cm^2$

So the area of base is $6 \times 9 - 3 = 51cm^2$

Multiply this by the height

$51 \times 7 = 357$

And so the volume is $357cm^3$.

Volume of Prisms



Mr T

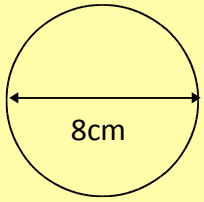
Because π is actually an infinite decimal, we either round π to 3.14 or simply leave the answer in terms of π.



Matthew

Matthew's amended notes for (A)

Plan view



The radius of the circle = 4cm

So the area of the base will be

$\pi r^2 = \pi \times 4^2 = 16\pi$ cm^2

Multiply this by the height

$16\pi \times 9 = 144\pi$

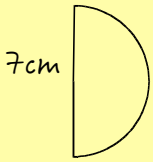
And so the volume is 144π cm^3.



Jon

Jon's amended notes for (B)

Plan view



The radius of the semi circle is 3.5m

So the area of base is

$(\pi r^2 = \pi \times 3.5^2) \div 2 = 12.25\pi$ m^2

Multiply this by the height

$12.25\pi \times 16 = 196\pi$

And so the volume is 196π m^3.

Fitness check

Calculate the volume of this cylindrical dustbin. Express your answer in terms of π.

The manufacturers claim the dustbin holds 95 litres of rubbish.

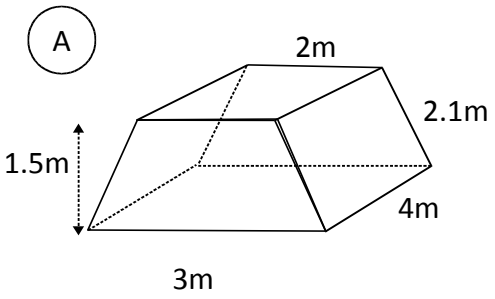
Is their claim accurate?

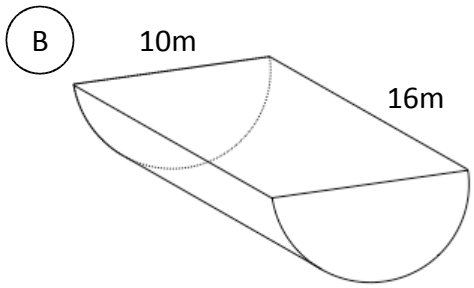


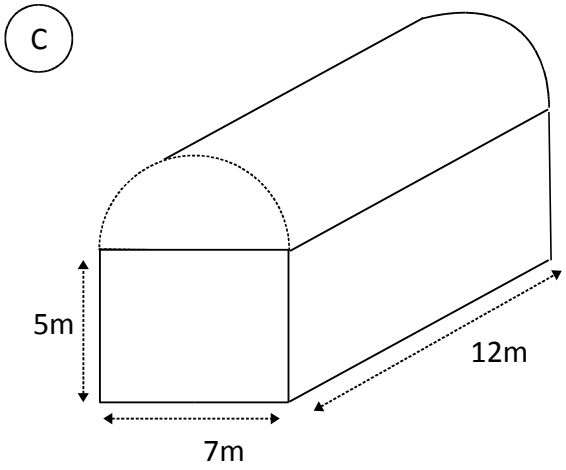
Volume of Prisms

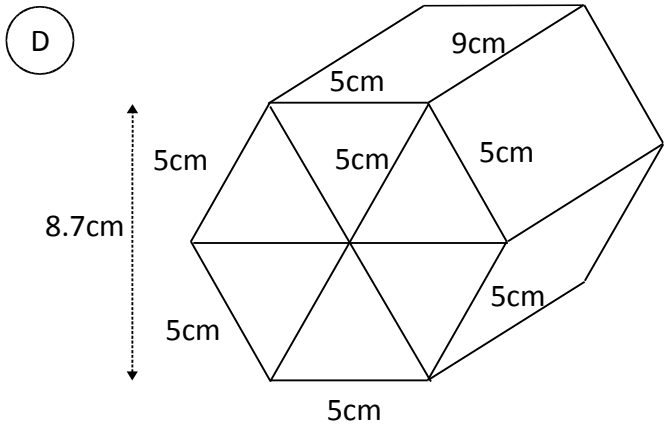
Fitness check

1. Find the volume of these prisms







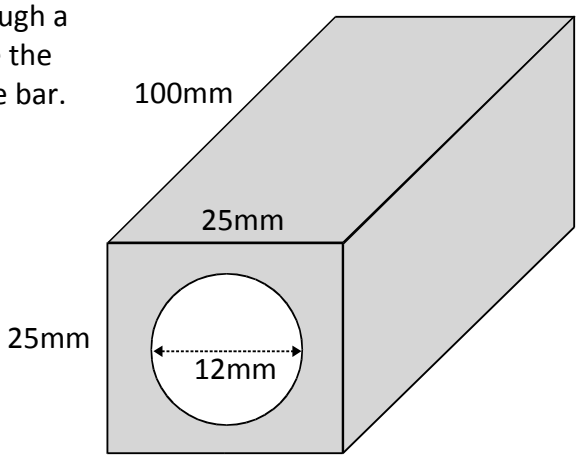


2. Find the volume of material used in this thick walled tube.



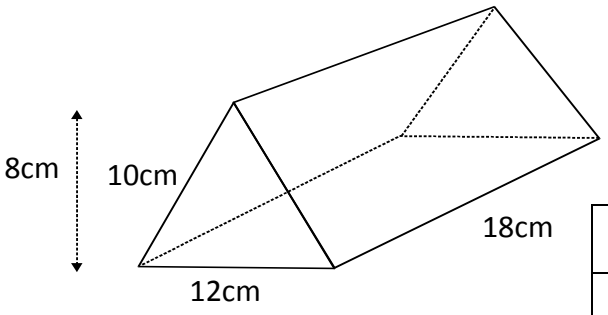
Dimensions
Internal diameter 40mm
External diameter 50mm
Length 800mm

3. A 12mm circular hole is drilled through a solid bar as shown below. Calculate the volume of material remaining in the bar.



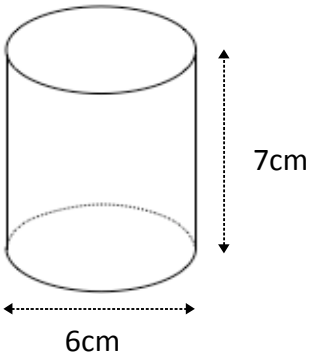
Volume of Prisms - Mastery Questions

1. What is the volume of this triangular prism?



A	B	C	D
$864cm^3$	$960cm^3$	$1728cm^3$	$2160cm^3$

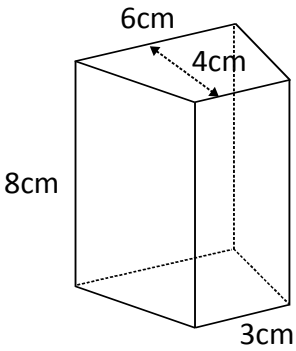
2. What is the volume of this cylinder?



A	B	C	D
$42cm^3$	$21cm^3$	$197.7cm^3$	$655cm^3$

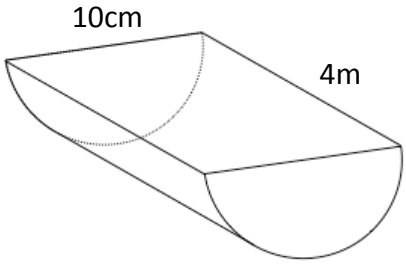
A	B	C	D
$36\pi m^3$	$54\pi m^3$	$108\pi m^3$	$216\pi m^3$

3. What is the volume of this prism?



A	B	C	D
$144cm^3$	$288cm^3$	$120cm^3$	$576cm^3$

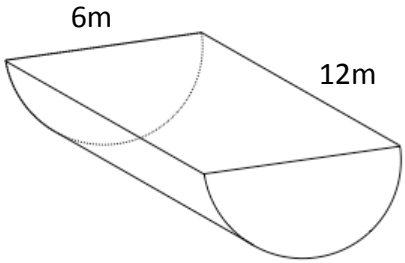
4. Which of the calculations would correctly give the volume of this semi-circular guttering?



A	$4 \times \pi \times 10^2 cm^3$
B	$4 \times \pi \times 5^2 cm^3$
C	$400 \times \pi \times 10^2 cm^3$
D	$400 \times \pi \times 5^2 cm^3$

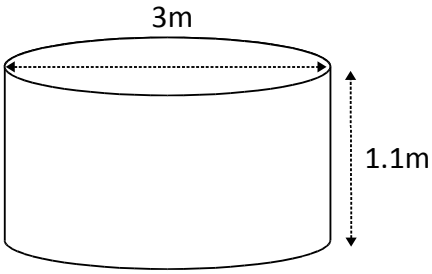
Volume of Prisms - Mastery Questions

5. What is the volume of this half pipe? Express your answer in terms of π.



A	B	C	D
$36\pi m^3$	$54\pi m^3$	$108\pi m^3$	$216\pi m^3$

6. What is the volume of this paddling pool? Express your answer in terms of π.



A	B	C	D
$2.48\pi m^3$	$1.82\pi m^3$	$3.63\pi m^3$	$9.9\pi m^3$

7. What is the volume of the paddling pool shown above in litres.

A	B	C	D
7.775L	77.75L	777.5L	7775L

8. A rectangular fish tank is partially filled with water as shown bin diagram 1. If the tank is repositioned as shown in diagram 2, what will be the depth of the water?

Diagram 1

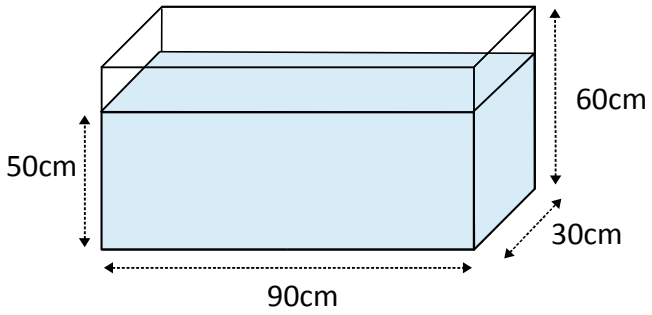
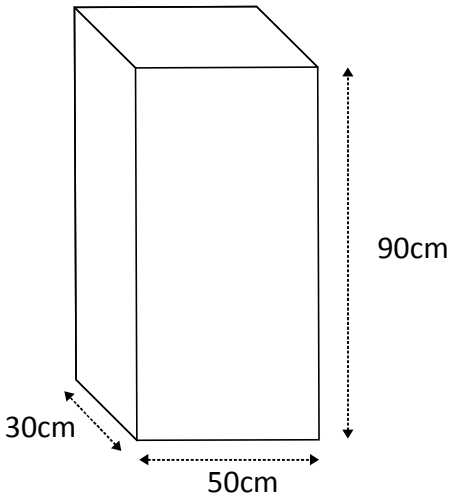


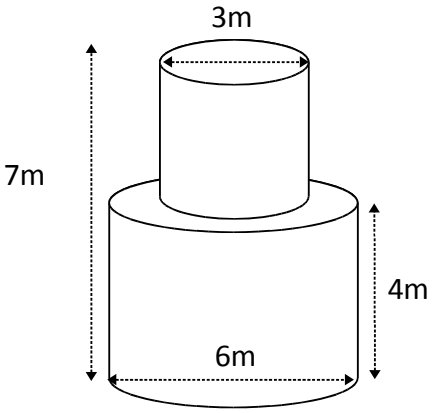
Diagram 2



A	B	C	D
50cm	60cm	70cm	75cm

Volume of Prisms - Mastery Questions

9. Which of these calculations would correctly give the volume of this sceptic tank?



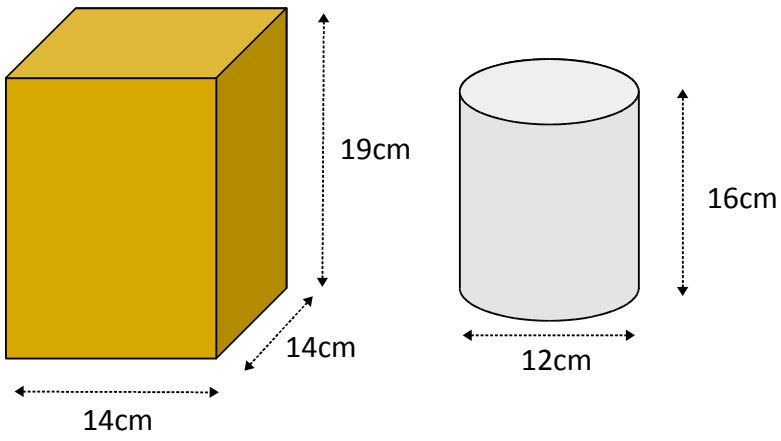
A	$4 \times \pi \times 3^2 + 3 \times \pi \times 1.5^2\ m^3$
B	$4 \times \pi \times 6^2 + 3 \times \pi \times 3^2\ m^3$
C	$7 \times \pi \times 3^2 + 3 \times \pi \times 1.5^2\ m^3$
D	$7 \times \pi \times 3^2 - 3 \times \pi \times 1.5^2\ m^3$

10. A cube has a volume of $125cm^3$. What is the area of one of its faces?

A	B	C	D
$25cm^2$	$5cm^2$	$10cm^2$	$150cm^2$

In Q11 – 12, you must show all of your working.

11. A valuable glass cylinder is transported in a wooden box (internal dimensions shown) surrounded by packing materials as shown below. Calculate the volume of the packing material required.



12. A feeding trough has a cross section as shown below. If the feeding trough is 9m long, how much feed would it hold?

